AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings of claims in the

5   application:

Listing of Claims:

1-38. (Canceled).

1   39. (New)   A method of a web-based system for distributing tasks, comprising:

2   coupling a distributed control management station to a communications network;

3   obtaining status information from a plurality of internet protocol ("IP") storage area

4   network ("SAN") units via said communication network;

5   storing said status information and a plurality of IP addresses associated to said

6   plurality of IP SAN units in a memory in said distributed control management station;

7   establishing a virtual SAN storage pool in response to said status information

8   including a spare IP SAN unit;

9   updating said virtual SAN storage pool in response to updating status from said

10   plurality of IP SAN units over said communications network;

11   receiving a first service request from a first host via said communication network; and

12   distributing said first service request to a first IP SAN unit in response to said virtual

13   SAN storage pool.

1   40. (New)   The method of claim 39, wherein said coupling a distributed control

2   management station to a communications network further includes:

3   connecting a server to the Internet ; and

25

4   assigning said server to manage distribution of various service requests from multiple

5   end users to said plurality of said IP SAN units substantially simultaneously.

1   41. (New)   The method of claim 39, wherein said obtaining status information from a

2   plurality of IP SAN units further includes:

3   identifying available storage space associated to each IP SAN unit; and

4   determining partitioned volume of storage space for sharing with multiple hosts.

1   42. (New)   The method of claim 39, wherein said establishing a virtual SAN storage pool

2   in response to said status information further includes:

3   listing a plurality of servers capable of performing storage area network for providing

4   multiple concurrent service requests; and

5   identifying available storage capacity with each of said plurality of servers that can be

6   employed for said service request.

1   43. (New)   The method of claim 39, wherein said updating said virtual SAN storage pool

2   in response to updating status from said plurality of IP SAN units further includes updating

3   said virtual SAN storage pool in response to disconnecting an active IP SAN unit from said

4   communications network.

1   44. (New)   The method of claim 39, wherein said updating said virtual SAN storage pool

2   in response to updating status from said plurality of IP SAN units further includes updating

3   said virtual SAN storage pool in response to connecting a new IP SAN unit to said

4   communications network.

1 45. (New)   The method of claim 39, wherein said updating said virtual SAN storage pool

2 in response to updating status from said plurality of IP SAN units further includes updating

3 said virtual SAN storage pool in response to changing of status for an active IP SAN unit.

1 46. (New)   The method of claim 39, wherein said updating said virtual SAN storage pool

2 in response to updating status from said plurality of IP SAN units further includes updating

3 said virtual SAN storage pool in response to activating a spare IP SAN unit when all of the IP

4 SAN units are busy.

1 47. (New)   The method of claim 39, further comprising:

2   receiving a second service request from a second host via said communications

3 network; and

4   distributing said second service request to a second IP SAN unit in response to said

5 virtual SAN storage pool.

1 48. (New)   The method of claim 47, wherein said distributing said second service request

2 to a second IP SAN unit in response to said virtual SAN storage pool further includes

3 identifying said second IP SAN unit in response to storage capacity requirement associated

4 with said second service request.

1 49. (New)   The method of claim 47, wherein said distributing said second service request

2 to a second IP SAN unit in response to said virtual SAN storage pool further includes

3 identifying said second IP SAN unit in response to video performance requirement associated

4 with said second service request.

1 50. (New)   The method of claim 47, wherein said distributing said second service request

2 to a second IP SAN unit in response to said virtual SAN storage pool further includes

27

3   identifying said second IP SAN unit in response to storage partitioning capability associated

4   with said second service request.

1   51. (New)   A web-based system for distributing tasks, comprising:

2   a plurality of hosts connected to a network infrastructure and capable of receiving

3   service requests from various end users;

4   a web-based server pool logically coupled to said plurality of hosts and having a

5   plurality of web-based servers, wherein said plurality of web-based servers are configured to

6   provide storage area network services;

7   a distributed control management station logically coupled to said server pool via said

8   network infrastructure, wherein said distributed control management station is configured to

9   distribute said service requests to said plurality of web-based servers over said network

10   infrastructure.

1   52. (New)   The web-based system of Claim 51, wherein each of said plurality of hosts

2   includes service modules, which are capable of communicating with said distributed control

3   management station.

1   53. (New)   The web-based system of Claim 51, wherein said network infrastructure is an

2   Internet.

1   54. (New)   The web-based system of Claim 51, wherein said distributed control

2   management station further includes management software modules for communicating with

3   said web-based server pool.

1   55. (New)   The web-based system of Claim 51, wherein each of said plurality of web-

2   based servers includes service modules for communicating with said distributed control

3   management station.

1   56. (New)   A method of web-based out-band accessed central controlled distributed

2   scalable virtual SAN for providing unlimited storage volumes on-demand and storage

3   sharing, comprising:

4   a)   the control management software of control station collecting storage information

5   from one or more unlimited SAN units based on a proprietary distributed virtual SAN

6   automatic cross-domain configuration protocol of this invention to form virtual SAN storage

7   pool;

8   b)   the console support software of control station organizing and converting the

9   information of virtual storage pool into presentable web-format, which is transmitted to and

10   is displayed in browser of storage management console;

11   c)   the console support software and control management software of control station

12   providing privileged user from web-browser on management console of console hosts to

13   select the management objects of any IP SAN unit in virtual SAN storage pool and its

14   associated storage devices, storage volumes, or network cards and status, any host system

15   and its associated devices and status, control station, its associated devices and status, and

16   spared IP SAN units or spared hosts for managing and monitoring; and

17   d)   the console support software work together with control management software of

18   control station providing two models of accepting storage volume requests from hosts and

19   further providing each host with unlimited storage volumes whenever it requires.

1   57. (New)   The methods of claim 56, wherein a) the said protocol sequence for automatic

2   constructing virtual storage pool of distributed virtual IP SAN includes

3   1)   when any of IP SAN units booting up, its service software of SAN sending out a

4   "SAN unit (n) startup" packet to distribute control management station, which includes IP

5   address, network cards, and system name of SAN unit (n); and

6   2)   when distribute control management software of control station receiving IP SAN

7   unit (n) packet or it detecting a communication link being up again after the link being down,

8   it storing the IP SAN unit (n)'s information into memory, disk or both on control station and

9   then sending back a "need SAN unit (n)'s storage info" packet to IP SAN unit (n);

10 3)   when SAN service modules on IP SAN unit (n) receiving the packet of "need SAN

11 unit (n)'s storage info", it getting storage information on IP SAN unit (n), and then sending

12 back a packet of "unit (n) storage info", which includes all information of storage device and

13 current associated storage volumes information, to distribute control management station;

14 4)   after receiving "unit (n) storage info" packet from IP SAN unit (n), the distribute

15 control management modules on distribute control management station updating its stored IP

16 SAN units with corresponding storage information of IP SAN unit (n) from packet.

1   58. (New)   The methods of claim 56, wherein a) the said protocol sequence for updating

2   storage pool of distributed virtual SAN when any IP SAN unit shuts down or communication

3   link is down, further includes:

4   (1)   whenever any IP SAN unit (n) shutting down, the service module of IP SAN unit (n)

5   sending "Unit (n) shutdown" to distribute control management station; and

6   (2)   after received "unit (n) shutdown" packet from IP SAN unit (n), or detected the

7   communication link being down between said IP SAN and control station, the distribute

8   control management software modules on control station updating the stored information for

9   that specific of IP SAN unit (n) and for the distributed IP SAN virtual storage pool.

1   59. (New)   The method of claim 57, further includes

2   the "unit (n) storage info" in packet including the number of storage volumes, each

3   volume's start address (logical block address, LBA), volume size, and the end address

4   (logical block address, LBA) of each volume, storage media type, IP SAN unit's IP addresses

5   and its associated network cards information; and

6   the startup packet being a very simple UDP packet with a "system startup message"

7   or a SMNP cold start packet and the said control management software of control station

8   detecting the different startup packet of different protocol.

1   60. (New)   The method of claim 58 further includes said "shut-down" packet being a very

2   simple UDP packet with a "system down message" or a SMNP cold start packet and the said

3   control management software of control station detecting and recognize the different startup

4   packet of different protocols.

1   61. (New)   The method of claim 56, wherein a) further includes,

2   (1)   "Virtual SAN automatic configuration protocol" being an UDP/TCP/IP based

3   protocol or any suitable IP based protocol with same protocol scenario and sequence for

4   boot-up and shut-down and further controlling the capacity of virtual SAN storage pool

5   dynamically adding or removing IP SAN units depending on the storage needs of said hosts;

6   and

7   (2)   all packets of said proprietary protocol taking the advantage of IP address, which

8   reaches to any point on the LAN or cross-domain Intranet, even Internet.

1   62. (New)   The method of claim 56, wherein b) further includes,

2   (1)   the web presentable formation being HTML, XML, WML and depending on the

3   connection link and associated protocols between control station and the system of storage

4   management console; and

5   (2)   the said associated protocols of HTML, XML, WML being HTTP, SOAP, WAP.

1   63. (New)   The method of claim 56, wherein c) further includes that,

2   (1)   the support of management console of this distributed virtual SAN provides web-

3   based centralized management for all IP SAN units, control management station and hosts to

4   perform tasks of storage configuration, storage volume creation, allocation and assignment,

5   merge and split, storage partition and repartitioning, resources and processes monitoring for

6   storage, network and all hosts; and

7   (2)   with multiple concurrent tasks supporting in console support software modules of

8   control station, each privileged user from the web-management console takes benefit of

9   issuing multiple simultaneous concurrent system operations and tasks.

1   64. (New)   The method of claim 56, wherein d) further includes a method of unlimited

2   storage volume distribution, which comprises:

3   each service software module of host sending a request for a storage volume with a

4   specific size to console support software of control management;

5   console support software together with control management software of control

6   station storing the received requests coupled with the information of said each host into

7   memory or disk storage or both on control station, and search its virtual storage volume pool

8   to find a matched storage volume on a IP SAN unit;

9   after finding a right storage volume on a specific IP SAN unit for said request and

10 validated that a corresponding said host being authorized to access the storage volume on

11 said specific IP SAN, the said control software on control station send the said requests and

12 the corresponding information of said each host to each said specific IP SAN;

13   after each party receiving required information, each said host and each

14 corresponding said IP SAN unit initiating negotiation and further for direct access to avoid

15 said control station to be a bottleneck for data accessing and hence to allow the control

16   station to dedicate handling host storage requests and continuing to update, maintain and

17   manage virtual storage volume pool.

1   65. (New)   The method of claim 64, further includes that

2   a.   the storage of each said IP SAN unit in virtual storage pool is configured and

3   partitioned with multiple volumes and to be assigned to multiple hosts;

4   b.   with support of service modules on each said IP SAN unit, multiple hosts each

5   assigned with different volumes on a same IP SAN unit and each host exclusively accessing

6   assigned volumes on the same IP SAN unit simultaneously without interrupt each other; and

7   c.   with said support of services modules on host, each hosts being assigned with

8   volumes from different IP SAN units and for further accessing.

1   66. (New)   The method of claim 61, wherein (2) further includes that the operation of

2   distributed IP SAN infrastructure in cross network domains environment allowing any IP

3   SAN unit (including mirrored or spared) or any host (including spared) and control

4   management station is anywhere on corporate Intranet, on Internet or on LAN.

1   67. (New)   The method of claim 56, wherein c) further includes

2   (1)   web-based distributed virtual SAN infrastructure providing multiple hosts each with

3   a pair of mirrored IP SAN units; and

4   (2) ·   web-based distributed virtual SAN infrastructure keeping ratio of spared IP SAN

5   unit.

1   68. (New)   The method of claim 56, wherein a) further includes:

2   (1)   each IP SAN unit containing the storage media, which are magnetic disk drive,

3   optical disk drive, solid state disk drive, or memory cards and the related storage control

4   media; and being in the form of RAID, JBOD;

5   (2)   coupled with the network connection media, which could be the controller of

6   Ethernet;

7   (3)   running with operating system which is Linux, Unix, MS Window, or real-time

8   OS; and

9   (4)   containing IP SAN services software modules, which is able to provide

10   management services to distribute control management station through IP based or non-IP

11   based protocols, and to provide block data service to one or more hosts through IP based

12   communication protocols.

1   69. (New)   The method of claim 68, further includes,

2   (1)   a Fiber Channel Based SAN unit appearing as an IP based SAN; and

3   (2)   fiber Channel based SAN containing Fiber Channel.

1   70. (New)   The method of claim 56, further includes that,

2   (1)   the control station is a server or a host, which is a server, a desktop, a laptop system,

3   or a handheld device with memory, storage media, network communication components,

4   CPU and capable to running software applications; and

5   (2)   running with operating system which is Linux, Unix, MS Window, or real-time OS.

1   71. (New)   The method of claim 56, further includes that

2   (1)   the software modules of web-based distributed virtual SAN includes console support

3   software modules, web server software modules and control management software modules

4   on control management station, the service software modules on IP SAN unit, and the service

5   software module of the host; and

6   (2)   the said web server software is a software on the marketing or a proprietary web

7   server software wherein all software modules of web-based virtual SAN are being

8   implemented with C, C++, Java, or XML; and

9   (3)   each software module supports IP based or non-IP based communication protocols

10 depending on the needs and nature of communication link; and

11 (4)   said software modules are complied into binary model and are packed into software

12 installation media of CDROM, DVD-ROM, memory card or transmitted cross network to

13 target system for installing on either control station, IP SAN unit, or host.

1   72. (New)   The method of claim 71, further include that software modules used in web-

2 based out-band accessed distributed virtual SAN infrastructure is a web-based operating

3 system.

1   73. (New)   The methods of claim 56, further include that

2 (1)   the web-based out-band virtual SAN is a central controlled distributed virtual

3 machine(CCDSVM);

4 (2)   the "Virtual SAN automatic configuration protocol" applied to various web-based

5 out-band CCDSVM in forming multiple different type of resource pools or application

6 service pools for unlimited on-demand application;

7 (3)   the IP SAN units in "Virtual SAN automatic configuration protocol" are replaced by

8 web server, video server, file server, security monitoring server, or database server unit; and

9 (4)   these different type of application service pools or resource pools of the distributed

10 virtual machine have dynamic capacity expanding, scalability, performance, disaster

11 recoverability, security, centralized management.

1   74. (New)   The method of claim 56, wherein c) further include that said out-band web-

2 based virtual SAN managing two groups of server systems, the IP SAN units and host

3 systems through web-browser; the group of host systems are capable of constructing a hosts

4 pool with proprietary "Virtual SAN automatic configuration protocol"; and as matter of the

5   fact that more groups of systems can be formed through same methods and to be managed

6   from same web-based management console.

1   75. (New)   The method of claim 64, further include that

2   (1)   the console support software also provides admin staff from storage management

3   console to manually assigning storage volumes to hosts;

4   (2)   any specific storage volume of any IP SAN unit exclusively manually assigned to a

5   specific host as long as admin staff acknowledge any host there is such needs; and

6   (3)   assigning information of the host to said IP SAN unit; and

7   (4)   after each party receiving required information, each said host and each

8   corresponding said IP SAN unit initiating negotiation and further for direct access to avoid

9   said control station to be a bottleneck for data accessing.